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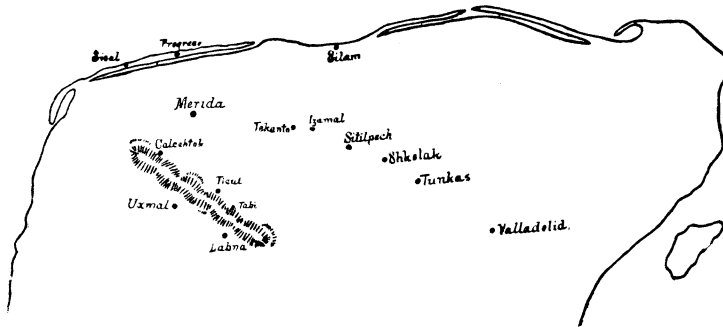
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LAND AND FRESH-WATER MOLLUSKS COLLECTED IN YUCATAN AND MEXICO.

BY HENRY A. PILSBRY.

The mollusks commented upon in the following pages, were collected by an expedition from the Academy of Natural Sciences of Philadelphia to Yucatan and Mexico during the months of February, March, April, May and June, 1890. The party consisted of Professor Angelo Heilprin (in charge), Messrs. Witmer Stone, J. E. Ives, F. C. Baker and Roberts Le Boutillier.

After touching at Havana, Cuba,² the party landed at Progreso, Yucatan; they penetrated southward in Yucatan as far as Tunkas and Labna.



The accompanying sketch map of northern Yucatan shows the position of the various localities at which collections were made.³

In Mexico proper, collections were made around Vera Cruz, at the town of Orizaba, at the city of Mexico and in its environs, at Lake Patzcuaro, situated near the western edge of the plateau, in the State of Michoacan, and at Yautepec, in the State of Morelos, lying southward from the city of Mexico, and off the Mexican plateau.

I have affixed the museum numbers of the specimens collected, after each locality.

¹ The marine shells collected on the coast of Yucatan and at Vera Cruz, have been catalogued by Mr. F. C. Baker. See Proc. Acad. Phila. 1891, pp. 45-55.

² See appendix A.

³ See Proc. Acad. Nat. Sci. Phila. 1891, p. 136, for descriptive notes on the topography and geology of northern Yucatan.

Family **TESTACELLIDÆ**.Genus **GLANDINA** Schum.**Glandina cylindracea** Phillips.

From an examination of an authentic specimen of *G. cylindracea* I conclude that *G. carnea* Pfeiffer, is completely synonymous. The species is abundant throughout northern Yucatan.

Tekanto (61510); Tabi (61503); Ticul (61504); Tunkas (61506); Sitalpech (61509); Izamal (61501); Labna (61507); Merida (61508); and between Sitalpech and Tunkas (61511).

Glandina spp.

A large species of this genus was collected at Vera Cruz, but the specimens (61638) are in poor condition.

Another species, also represented by bleached examples only, was found at Yautepec (61634).

Still another large species was found at Shkolak, Yucatan (61637) and at Izamal (61636), and another at Purga, Province of Vera Cruz (61635).

Glandina (Varicella) speciosa Pfr.

Orizaba (61505).

Glandina (Selasiella) perpusilla Pfr.

Hills around Orizaba (61502).

Genus **STREPTOSTYLA** Shuttl.**Streptostyla Edwardsiana** Crosse & Fischer.

Orizaba (61513).

Streptostyla physodes Shuttl.

Orizaba (61512).

Streptostyla vexans Strebel.

Orizaba (61515).

A small, slender form, apparently belonging to this species.

Several small species have not yet been positively determined.

Subgenus **ORYZOSOMA** Pilsbry.

The Nautilus, iv, (ii), May, 1891.

Shell perforated; the columella thickened, simply concave, almost imperceptibly sinuous above.

Streptostyla (Oryzosoma) Tabiensis Pilsbry, n. sp. (Pl. XV, figs. 6, 7.)

Shell small, ovate-turritid, rather thin, the base deeply indented and minutely perforated. Spire conic, obtuse; whorls 6, slightly

convex; apical $1\frac{1}{2}$ whorls wide, forming a globose nucleus, the following $\frac{1}{2}$ whorl excessively narrow. Suture simple, narrowly margined.

Aperture small, narrow above, one-half the length of the entire shell; outer lip thin, produced forward in the middle; columella thick, a little reflexed, concave on the apertural side; receding a trifle above. Surface polished, scarcely broken by slight growth-lines. Color translucent-whitish, (denuded of epidermis).

Alt. 9.8, diam. 4.8 mm. Alt. of aperture 4.8, greatest breadth of aperture 2.5 mm.

Cave in the mountains, near the hacienda of Tabi, Yucatan (61, 630). Dead and denuded of epidermis.

This seems to be perfectly distinct from all described species in its funnel-shaped, perforate base, and the lack of a convex columellar fold.

Genus **PSEUDOSUBULINA** Strebel & Pfeffer.

Pseudosubulina Berendti Pfr.

Hills around Orizaba (61494).

Pseudosubulina sp.

A very minute form, probably undescribed. Orizaba (61493).

Pseudosubulina (Volutaxis) Miradorensis Strebel(?)

Orizaba (61545).

Family **LIMACIDÆ** s. lat.

Genus **ZONITES** Montf.

Zonites (Zonyalina) bilineatus Pfr.

Hills, 300–500 ft. above Orizaba (61522); a bandless form (61521) was collected at the same locality.

Zonites (Hyalinia) indentatus Say.

Yautepec (61520). This easily recognized species seems to inhabit the greater part of North America; it is the most abundant of the smaller *Zonites* in Texas.

Zonites (Hyalinia) subhyalinus Pfr.

Hills around Orizaba, about 500 ft. above the town. (61523.)

Genus **STENOPUS** Guild.

= *Stenopus* + *Guppya* Mörch + *Habroconus* C. & F.

Stenopus elegans Strebel.

Hills around Orizaba (61550); Yautepec (61549).

Family **HELICIDÆ**.Genus **HELIX** L.

I would restrict this genus to those snails having the genital apparatus complicated by the presence of a flagellum upon the penis-sac, in the male system; and in the female system a long duct to the receptaculum seminis which frequently branches out into a long blind sac, a dart-sac or sacks, and a pair of accessory mucus or digitate glands.

In some species one or more of these organs may be undeveloped; but the majority of them are always present.

Helix aspersa Müller.

This form, introduced from Europe, is very abundant in the environs of the city of Mexico (61535), especially in the park at Chapultepec.

Helix ? (Praticola) griseola Pfr.

Vera Cruz (61534).

Genus **POLYGYRA** (Say) Pilsbry.

Equals, in part, *Anchistoma* Ads., Tryon, Fischer and others. Includes as sections, *Polygyra*, *Mesodon*, *Triodopsis*, etc.

I have adopted *Polygyra* as the name for that group of American *Helices* characterized by a horn-colored striate shell, with reflected white peristome, usually toothed within; ribbed jaw; genitalia simple, without dart-sac or appendages other than the essential organs, penis without flagellum, duct of the spermatheca short.

See, on this genus, Proc. Acad. Nat. Sci. Phila. 1889, p. 193.

Polygyra sp.

Yautepec (61554). Fragments only.

Genus **PATULA** Held.

This world-wide distributed genus is characterized by a discoidal or conical striated shell, usually broadly umbilicated, having a simple sharp lip, *not thickened within* or reflexed, and by the simple genitalia. Many of the species are viviparous. A host of sectional names have been proposed, mostly for groups, of but little systematic value. I regard *Acanthinula* as a section of *Patula*.

Tropical America is inhabited by a group of thin-shelled light-colored forms of *Patula* known as *Microphysa*. This name being preoccupied, we may substitute *Thysanophora* Strebel, proposed for Mexican species allied most intimately to *P. incrustata* Poey, etc.

Of this name, *Acanthinula* Strebel (not Beck) and *Ptychopatula* Pilsbry, as well as *Microphysa* Martens (preoc.) must be considered synonyms.

Microconus of Strebel is very closely allied, but it may perhaps be considered closer to the section *Discus* of *Patula*. The genus *Patula* has been much more minutely sub-divided than the existing modifications warrant.

***Patula coactiliata* Fér.**

Tunkas (61489); Labna (61488).

***Patula Hermannii* Pfr.**

Hills 500 ft. above Orizaba (61536).

This species has a peculiar aperture. The dentition should be examined. It may prove to belong elsewhere than in *Patula*.

***Patula paleosa* Strebel.**

Hills 500 ft. above Orizaba (61556).

***Patula granum* Strebel.**

A specimen apparently of this species but of a clear whitish color was collected at Progreso, Yucatan (61555).

***Patula conspurcatella* Morelet.**

Merida (61490), Tunkas (61491) and Tekanto (61487), Yucatan; Vera Cruz, Mexico (61492).

I am unable to separate the Vera Cruz specimens from those from Yucatan.

***Patula impura* Pfr.**

Vera Cruz (61557) Yauatepec (61558) Mexico.

This differs from *P. conspurcatella* in lacking the delicate, very oblique cuticular folds usually visible on that species, if I am right in my identification of it. I believe the *Thysanophora impura* of Strebel to=*P. conspurcatella*. These species are very closely allied to the *Patula* ("*Microphysa*") *incrustedata* Poey, a species ranging along the Gulf coast from Texas to Florida, originally described from Cuba.

***Patula intonsa* Pilsbry, n. sp. (Pl. XV, figs. 1, 2, 3.)**

Shell very small, narrowly umbilicated, thin, chestnut-brown, semi-globose. Whorls 4, well rounded, separated by very deeply impressed sutures. Apex obtuse; last whorl rounded at the periphery. Surface smooth, very lightly striatulate, having long, whitish, sparsely scattered, delicate hairs, usually rubbed off except at the sutures. Aperture slightly oblique, oval, parietal wall a little flat-

tened. Lip sharp, acute, very slightly expanded at the columellar margin. Alt. 2, diam. 1·8 mill.

The specimens were collected at Orizaba, Mexico (61986).

The sparsely scattered, partly deciduous hairs are peculiar and characteristic.

Family **PUPIDÆ**.

Genus **PUPA** Drap.

(Section *Bifidaria* Sterki.)

Pupa contracta Say.

Typical specimens were collected at Orizaba (61433), and at Yautepec (61432).

Pupa servilis Gould.

Merida, Yucatan (61435); Yautepec, Mex. (61434).

Specimens have been examined by Dr. V. Sterki, who considers them true *servilis*. The Yautepec specimens are a trifle slenderer and paler than usual.

Genus **EUCALODIUM** Crosse & Fischer.

Eucalodium (*Coelocentrum*) **flicosta** Shuttlw.

Hills around Orizaba (61519).

Family **BULIMULIDÆ**.

Genus **BULIMULUS** (Leach) Auct.

Bulimulus tropicalis Morelet.

Ruins of Labna, Yucatan (61544).

Bulimulus Dysoni Pfr.

Tabi, Yucatan (61514).

Bulimulus sp.

A large number of species of this genus were collected, which the writer has not yet determined.

Family **CYLINDRELLIDÆ**.

Genus **CYLINDRELLA** Pfr.

It is evident that a number of the *Cylindrellas* of Central America will prove to be merely local races; the distinctions do not seem to be at all well defined.

Cylindrella speluncæ Pfr. (Pl. XV, figs. 15, 15a.)

(*C. costulata* Morel., not C. B. Ad.)

The specimens collected seem to connect this species with *C. morini* Morel. The localities are: Cave at Tabi (61517); Ticul (61987); between Sitalpech and Tunkas (61518).

C. speluncæ Pfr., var. **dubia** Pilsbry, n. var. (Pl. XV, figs. 14, 14a.)

A more slender form, always truncated and decidedly smaller, measuring alt. 10, greatest diam. $1\frac{3}{4}$ to 2 mm., having 12 or 13 whorls remaining, was collected at Labna, Yucatan. There are 17 or 18 riblets on the penultimate whorl, about the same number that the specimens of *speluncæ* before me possess.

Cylindrella Bourguignatiana Ancey. (Pl. XV, figs. 13, 13a.)
Annales de Malacologie II, p. 243, 1884-86.

This species has not heretofore been figured. The specimens before me (six in number) are part of the original lot collected by Mr. Charles Torrey Simpson on the island of Utila, Honduras.

The species is allied to *C. speluncæ*, *morini* and *subtilis*, but is always truncated, having nine or ten whorls remaining; it is compact in form. There are 17 riblets on the penultimate whorl; the base is pinched into an acute carina.

Two specimens measure :—

Alt. $10\frac{1}{2}$, greatest diam. $2\frac{1}{2}$ mm., whorls 10.

Alt. 10, greatest diam. $2\frac{3}{4}$ mm., whorls 9.

The base is not so much narrowed as it is in *C. speluncæ*, etc., and the shell is wider than *C. speluncæ* var. *dubia*.

Genus **MACROCERAMUS** Guilding.

Macroceramus concisus Morelet.

A very abundant species in Yucatan. Specimens were collected at Izamal (61785), Merida (61553), Tekanto (61552), Tunkas (61551), between Tunkas and Sitalpech (61786), Ticul (61575), Uxmal (61784), Santa Ana, near Calcehtok (61576).

This species seems to be slenderer than *M. Gossei*, but it is excessively variable in length. *Macroceramus Gossei* var. *arctispirus* Ancey, (Annales de Malac. II, p. 242) described from the island of Utila, is a small form of this species, exactly corresponding with the smaller specimens which occur with typical *concisus* at Merida, Tekanto, Tunkas, and other localities.

Specimens collected by Simpson are before me, being a part of the original lot.

Macroceramus pontificus Gld.

A single immature specimen collected at Orizaba (61576) may be referred to this species, although with some doubt.

Family **LIGUIDÆ.**Genus **Liguus** Montf. 1810.(Subgenus **Orthalicus** Beck, 1837.)

This genus is in great confusion owing to the great variability of the shells and the presence of intermediate forms connecting a number of the described species.

Orthalicus princeps Brod.

Vera Cruz, (61538). Specimens a little slenderer, but which seem to be not specifically distinct were collected in Yucatan at Shkolak (61539), Ticul (61541), between Sitalpech and Tunkas (61537) and at Silam (61542).

Orthalicus Férussaci Martens.

Shkolak (61532) and Tekanto (61540), Yucatan.

Specimens which seem to belong to this species are in the collection of the Academy from Mazatlan.

Orthalicus melanocheilus Val. (1833).

One of the most distinct species of the genus, described originally from "New Spain." The Florida specimens differ from the Mexican and Central American in a number of characters and seem to me perfectly distinct as a geographic variety.

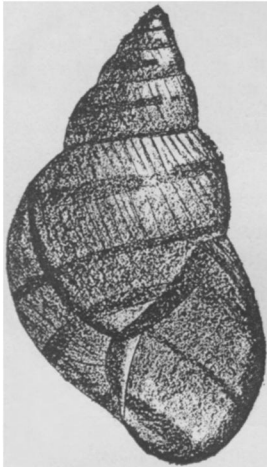
O. melanocheilus var. **Floridensis** Pilsbry, n. var.

Shell white or slightly stained with brown, having no longitudinal zigzag flames. The body-whorl has three narrow brown bands, the upper one often broken into spots. There is a black varix on the penultimate whorl, and one or two on the body-whorl. The varices are generally *not visible within the aperture, but the three spiral bands are conspicuous there*. Lip bordered with blackish-brown; columella white-edged, but parietal callus deep-brown.

The types of this variety are from near Cape Sable, Florida.

The synonymy of my variety includes:
Bulimus zebra W. G. Binney, Terr. Moll. U. S. Vol. IV, Pl. lxxviii, fig. 12.

O. zebra W. G. B. & T. Bld., Land and Fresh-water shells of N. A. vol. I, p. 216, figs. 370, 371.



Orthalicus melanocheilus var. *Floridensis*.

O. undatus W. G. B., Manual of N. A. Land shells, p. 440, fig. 483.

Family **STENOGYRIDÆ** Fischer.

Genus **RUMINA** Risso, 1826.

Rumina (*Subulina*) *trochlea* Pfr.

Abundant at Izamal, Yucatan (61496). It is certainly only a variety of *S. octona*.

Rumina (*Opeas*) *Caracasensis* Rve.

Hills around Orizaba ; and at Vera Cruz.

Family **SUCCINEIDÆ**.

Genus **SUCCINEA** Drap.

Succinea *luteola* Gould.

Progreso, Yucatan (61495).

Succinea sp.

A slender species, quite fragile and light brown in color, was collected at Santa Ana, near Calcehtok, Yucatan. (61546.)

Succinea sp.

San Juan, near Vera Cruz (61548). A single poor specimen.

Succinea *campestris* Say.

Specimens which I am unable to separate from this species were collected at Lake Texcoco, near the City of Mexico. (61541.)

Family **AURICULIDÆ**.

Genus **CARYCHIUM** Müll.

Carychium *exiguum* var. **Mexicanum** Pilsbry, n. var. (pl. XIV, figs. 7, 8, 9).
The Nautilus, iv (ii), May, 1891.

Shell minute, cylindrical, tapering above to an obtuse apex; waxen whitish, somewhat translucent; whorls $4\frac{1}{2}$, convex, separated by rather deep sutures. Aperture one-third the length of the shell, rather oblique; outer lip expanded, thin above, suddenly becoming very much thickened on its outer portion by a heavy deposit of callus upon its face and inner edge; columellar margin having an obtuse projection (scarcely a tooth) below, and an acute entering fold above. Surface having very delicate oblique striæ of growth.

Alt. 1·8, diam. ·8 mm.

Hills around Orizaba, at an altitude of about 500 feet above the town.

In *The Nautilus* for 1891, vol. IV, p. 109, I gave a brief notice of the forms of *Carychium* found within the United States. In my study of the Mexican specimens I was obliged to go over the whole subject anew, and to examine very extensive suites of American specimens. In the present condition of our knowledge, so far as the collections examined permit me to see, three species may be distinguished and two varieties; viz. *C. exiguum*, *C. exiguum* var. *Mexicanum*, *C. exile*, *C. exile* var. *Jamaicensis*, and *C. occidentalis*.

Only the collection of specimens from points geographically intermediate between the extremes of the range of this genus, and the examination of such material by a competent person, can finally decide the question of the number of naturally defined species, and which, if any of them, must be considered geographic races or subspecies.

Carychium exiguum Say. (Pl. XIV, figs. 1, 2, 3; pl. XV, fig. 16.)

Shell *cylindrical*, the last two whorls of about equal diameter. Whorls $4\frac{1}{2}$. Aperture decidedly over one-third the total altitude. Outer lip sinuous, moderately thickened, very strongly arcuate at its upper outer portion.

This is the common East American form, ranging from Maine southward and westward, the limits of its range not exactly determined as yet.

Carychium exiguum var. **Mexicanum** Pilsbry (Pl. XIV, figs. 7, 8, 9.)

Shell cylindrical. Whorls $4\frac{1}{2}$. Aperture equal to, or a trifle exceeding one-third the total altitude of shell. *Outer lip thickened at and below the middle by a very heavy deposit of callus upon its face.* Lower fold of the columella sub-obsolete. Surface delicately striated.

Orizaba, Mexico.

Carychium occidentalis Pilsbry. (Pl. XIV, figs. 4, 5, 6.)

Shell *distinctly conical*, tapering. Whorls 5. Aperture very oblique, larger than in *C. exiguum*, the outer lip flatly expanded, thin, *not at all thickened on its face.*

Portland, Oregon, is the only locality from which I have seen this species.

Carychium exile H. C. Lea. (Pl. XIV, figs. 10, 11, 12, 13, 14.)

Shell *elongated*. Whorls $5-5\frac{1}{2}$. Aperture small, very oblique, about *one-third the length of the shell.* Outer lip more or less thickened. *Surface closely, regularly and very distinctly striated.*

Eastern Pennsylvania (H. C. Lea) ; Kent, Ohio (Geo. W. Dean.)

Lea found this form on the Wissahickon Creek, near Philadelphia, but I have not been able to rediscover it there.

Carychium exile var. **Jamaicensis** Pilsbry (Pl. XIV, figs. 15, 16.)

Much elongated, similar to *C. exile*, but the surface smooth, not perceptibly striated.

Jamaica (Robert Swift collection).

Genus **MELAMPUS** Montf.

Melampus coffea L.

Progreso and Silam (61470), Yucatan.

Melampus coffea var. **microspira** Pilsbry n. var.

Distinctly shouldered, spire extremely short, the earlier whorls very closely coiled, the last whorl becoming wide ; color uniform pinkish-olive. Alt. 13 mm., diam $8\frac{1}{2}$ mm., length of aperture 12 mm.

Progreso, Yucatan (61471).

Family **LIMNÆIDÆ**.

Genus **LIMNÆA** Lam.

Limnæa attenuata Say.

Lake Chalco, Mexico (61483).

This common form bears the same relation to our northern *L. reflexa*, that *Planorbis tenuis* bears to *Pl. trivolvis*.

Limnæa Cubensis Pfr.

Rather small specimens of this were collected in the stream at Orizaba (61482 and 61481). They vary much in the degree of exertion of the spire.

A few notes on the synonymy of this and allied species may not be out of place here.

The *L. umbilicata* C. B. Ad. is completely synonymous with *L. Cubensis*. Havana specimens of the latter are absolutely indistinguishable from the Vermont *L. umbilicata* in our collection, received from Professor Adams himself. *L. Cubensis* (+*umbilicata*) is perfectly distinct from *L. caperata* Say, and from *L. humilis* Say, with both of which it has been confused by some authors.

The typical *Cubensis* ranges at least as far west as the Mississippi River, and eastern Texas. West and southwest of this it gives place to *L. techella* Hald., and *L. bulimoides* Lea. The last form may be considered a geographic race or subspecies of the *Cubensis*. *L. techella* Hald. is nearly identical with *umbilicata*.

The synonymy and range of the forms mentioned may be summarized as follows:

L. Cubensis Pfr.

Syn.: *L. umbilicata* C. B. Ad.; *L. techella* Hald.

Habitat: New England to Cuba; westward to St. Louis, Missouri, southwest to Texas and Province of Vera Cruz, Mexico.

L. Cubensis var. *bulimoides* Lea.

Habitat: Western U. S., east to Dakota, Central Nebraska (at Ogallala, coll. by Simpson), and Western Texas.

The European *L. truncatula* Müll. is scarcely separable from *Cubensis* in conchological characters. I have retained the European and American forms separate because their areas of distribution are now so distinct that interbreeding can no longer occur.

The *L. humilis* Say is likely to be confused with small examples of *L. Cubensis*, but it differs in having the expansion of the columella much narrower and of a wholly different form. Say's types of *L. humilis* are before me.

Genus **ANCYLUS** Geoff.

Ancylus excentricus Morelet.

Shkolak, Yucatan (61787).

I may mention here that *Ancylus excentricus* Morelet has been collected in Comal Creek at New Braunfels, Texas, and therefore may be expected throughout Eastern Mexico. The same is true of *Planorbis cultratus* Orb., which I have also received from Southern Texas.

Genus **PLANORBIS**¹ Guettard.

Planorbis tenuis Phil.

An abundant species in the vicinity of the City of Mexico (61607; 61780; 61781; 61625).

The form called var. *Boucardi* by Crosse & Fischer intergrades perfectly with the typical *tenuis* in Lake Chalco. In Lake Patzcuaro a form was collected which is referable to *P. tenuis* v. *Boucardi*, but in which the characters of that variety are considerably exaggerated. One of these (No. 61625 of the collection) is figured

¹ *Planorbis glabratus* Say has not been found in Mexico; nor does it range in the United States, outside of the peninsula of Florida. The *P. glabratus* of authors is not the true *glabratus* of Say.

on pl. XV, fig. 4. See, in this connection, the remarks under *Physa Patzcuarensis*.

Planorbis Caribæus Orb.

Shkolak, Yucatan (61778).

The specimens correspond in every detail with Havana examples of *P. Caribæus* received from Arango.

Planorbis tumidus Pfr.

Vera Cruz (61775; 61591); Orizaba (61779).

Planorbis Maya Morelet.

Merida, Yucatan (61538; 61529). These are larger than indicated by MM. Crosse & Fischer, measuring, alt. $2\frac{3}{4}$, diam. maj. $11\frac{1}{2}$, diam. min. 9 mm.

Planorbis orbiculus Morelet (1849).

(Syn. *Pl. Haldemani* Dkr., 1850, not C. B. Ad. 1849.)

San Juan, near Vera Cruz (61593).

Planorbis Liebmanni Dkr.

Vera Cruz.

A form closely allied to the preceding, but smaller, with the last whorl wider. I regard the identification as undoubtedly correct.

This species occurs in Texas also, as far north as Austin.

Planorbis retusus Morelet?

Specimens probably referable to this species were collected at Shkolak, Yucatan (61777).

Planorbis parvus Say.

Specimens in every respect typical were collected at Yautepec, Mexico (61592).

Genus **PLANORBULA** Hald.

Planorbula obstructa Morelet.

Ticul, Yucatan (61589).

This species occurs abundantly in Texas as far north as Austin.

Family **PHYSIDÆ** Dall.

Genus **PHYSA** Drap.

The Mexican Physæ have been referred by MM. Crosse & Fischer to six species, as follows: *Mexicana* Phil., *Boucardi* C. & F., *Strebeli* C. & F., *Berendti* Dkr., *squalida* Morelet and *Tehuantepecensis* C. & F. Of these names, *Boucardi* is a synonym of *osculans*

(=*Mexicana*, *vid. infra*); *Strebeli*, *Berendti* and *Tehuantepecensis* are very closely allied to *squalida*, being perhaps only local forms.

A critical review of the *Physæ* of the United States¹ causes me to recognize in that area *eleven species* and about the same number of local forms or geographic races susceptible of diagnosis.²

Most Mexican specimens of *Physa* differ from those of the Eastern United States in lacking a thickening or rib within the lip-margin in the adult state. This is probably due to the far less amount of difference between the seasons, and the consequent lack of periodicity of growth in the shells. This peculiarity extends, as might be expected, to the Californian species; but in some arid localities, æstivation during the season of excessive drought produces practically the same shell-structure as that caused by the winter hybernation of our Northern *Physæ*.

***Physa osculans* Hald.**

Lake Chalco, City of Mexico (61627); City of Mexico (61584 and 61586); Lake Texcoco (61585); Between San Angel and Coyoacan, south of the City of Mexico (61587); Yautepec (61788 and 61526).

An examination of Haldeman's types of *Physa osculans* (Monog. Limniades, pl. 2, figs. 11, 12), renders it certain that the *Physa Mexicana* of Philippi is synonymous. The fig. 13 of Haldeman's plate is a different species, as the author of the Monog. Limniades himself supposed. The *Physa Boucardi* of Crosse and Fischer is likewise a mere form (*not a variety*) of *osculans*, the alleged differences having no specific or varietal weight, whatever, in this genus.

Physa osculans is readily distinguishable from the eastern forms *P. heterostropha*, *integra* and *gyrina*; but several described Californian *Physas* present no differences from the Mexican species, and must be considered synonyms.

***Physa osculans* var. *Patzcuarensis* Pilsbry, n. var. (Pl. XV, fig. 5.)**

Shell thin, light, obconic, very broad across the upper part of the body-whorl, narrow below; spire short, small, acute, composed of four rapidly enlarging whorls, the first one black. Columella long, vertical, slightly sinuous; lip strongly arcuate above, thin; color light-brown or whitish; surface shining, wholly lacking spiral lines,

¹ See *Shells of Forest and Stream*, a handbook of Northern United States land and fresh-water shells, now in preparation.

² During the course of my studies of U. S. *Physa* I have examined type specimens of almost every one of the described species, nearly fifty in number.

obscurely and finely longitudinally plicated. There are no variceal thickenings, no internal lip-rib, and the surface is nowhere mal-leated.

Alt. 15, diam. 11; alt. of apert. $12\frac{1}{2}$, greatest width $6\frac{1}{2}$ mm.

Lake Patzcuaro, Mexico (61629). Animals of the same suite in alcohol.

This shell resembles the more extreme forms of *Physa ancillaria* Say (known as *Ph. Lordi* Bd. and *Ph. Parkeri* Cur.); and it perhaps bears the same relation to *Ph. osculans* Hald. that *Ph. ancillaria* v. *Lordi* bears toward *Ph. heterostrophia*.

The relation of my new form to the boreal American types named is, however, only one of analogy; for the *Lordi* is demonstrably an extreme development of the *heterostrophia* type, while my Mexican shells belong to the group of *Ph. osculans*, being in my opinion a geographic race of that species.

The cause of the dilation of the body-whorl in these shouldered *Physas* has not been explained. I would suggest that the form in these cases is correlated with an increase in the capacity of the air sack or lung, which occupies that part of the shell. Observation of the habits of the snail would probably reveal the reason for this additional lung capacity. It is not unlikely the result of a more continuous or prolonged subaquatic residence. Precisely the same modification is found in the *Planorbis* before me from this same Mexican lake (Patzcuaro), evidently induced by the action of the same causes.

***Physa squalida* Morelet.**

Orizaba (61530; 61583; 61598; 61581); Vera Cruz (61582).

A very abundant species at Orizaba. This is the Mexican representative of the *Physa integra* of Haldeman, a species usually confounded in the United States with *P. heterostrophia* Say. I have compared the Orizaba specimens with *squalida* received from Morelet.

This species frequently exhibits variceal thickenings (indicating former peristomes), like its Northern ally *P. integra*. In this respect it differs from *Ph. osculans*.

The more lengthened forms of *Ph. squalida* resemble somewhat *Ph. pomilia* Conrad.

Genus **APLEXA** Flem.

The number of Mexican species of this genus has been about fifty per cent over-estimated by Crosse and Fischer. This opinion is

founded on an examination of many specimens, and I express it with all due respect to the authors named.

They seem to have overlooked the description and figure of *Physa* (= *Aplexa*) *princeps* Phillips, described from Yucatan, in the Proceedings of the Academy of Natural Sciences of Philadelphia, III, p. 66, pl. 1, fig. 11 (May, 1846). The figure is very good.

***Aplexa cisternina* Morelet.**

Izamal (61601), Tekanto (61599), Shkolak (61770) and Merida (61524), Yucatan.

***Aplexa nitens* Phil.**

Vera Cruz; San Juan, near Vera Cruz (61771).

***Aplexa nitens* var. *spiculata* Morel.**

Merida, Yucatan (61600).

***Aplexa* sp.**

Shkolak (61772, 61773). Forms I have been unable to identify.

Family **CYCLOPHORIDÆ.**

Genus **CYCLOTUS** Guilding.

***Cyclotus Dysoni* Pfr.**

One of the most abundant land shells of northern Yucatan. It was collected at Silam (61458; 61461), Shkolak (61459), Tekanto (61452), Labna (61435), Tunkas (61452), Ticul (61460), Sitalpech (61462), Tabi (61463), and between Sitalpech and Tunkas (61457).

The specimens from Tabi, Ticul and some other localities are prettily varied by numerous dark spiral lines and bands; these may be named form *multilineatus*. Many specimens have the costulae of the surface simple, not all undulating, not anastomosing.

***Cyclophorus* (*Cyrtotoma*)—?**

Two broken specimens of a species apparently new, were collected at Orizaba (61486).

Family **AMPULLARIIDÆ.**

Genus **AMPULLARIA** Lam.

***Ampullaria flagellata* Say.**

My examination of Say's type of this species proves that *A. malleata* Jonas is a synonym. The specimen, now before me, upon which Say founded his species, is a dead shell, lacking the epidermis; it is moderately but not conspicuously malleated, and on the latter

part of the body-whorl obscurely plicated in the direction of the lip-edge. It is multifasciate with brown.

The species is excessively abundant in the environs of Vera Cruz (whence Say procured it). It varies widely in respect to sculpture and color, but the numerous Vera Cruz specimens before me are rather constant in size, agreeing in the main with Say's type, which measures as follows:—

Alt. 38 mm.; diam. 35 mm.; greatest length of mouth 32 mm.; width of mouth (measured at a right angle to its length) $21\frac{1}{2}$ mm. The aperture of this specimen is expanded,—a variation not uncommon in the series before me from Vera Cruz. (No's. 61447, 61446, 61448, Acad. Coll.)

The illustrations given by Crosse & Fischer on pl. 44, figs. 6, 6a, 6b, 6c, 6d and 6e, of the Expéd. Scientifique du Mex., represent the species as found around Vera Cruz, but smoother forms are also abundant, and spiral dark bands are visible on most specimens.

Ampullaria sp.

San Juan, near Vera Cruz (61450).

Ampullaria Yucatanensis Crosse & Fischer.

"Twin cenotas," Shkolak, Yucatan (61456).

Family **VALVATIDÆ**.

Genus **VALVATA** Müll.

Of this genus six species are found on the mainland of North America.

Valvata humeralis Say.

Lakes around the City of Mexico (61484). Lake Patzcuaro, West Mexico (61444).

The specimens from the last locality I at first regarded as a distinct species; but making due allowance for the modification undergone by all species of snails found in this lake, I am disposed to consider it a variety of *humeralis*. Compared with Say's type specimen of the latter, the L. Patzcuaro shells have the whorls more rapidly increasing, the last whorl being notably of greater diameter than, the corresponding volution of *humeralis*; the umbilicus is narrower, the subsutural flattening, so obvious in Say's shell, is not at all conspicuous. The obtuse basal carina is as in the type. No good figure of *humeralis* has been published, that given by Strebel having the spire too much raised; it is rather obtuse in the shells before me

from the City of Mexico, as well as in Say's type; the exact locality of the latter is not given on the label, which is in the fine hand-writing of Mrs. Say, like many of Say's labelled types.

Results of great importance to biology might be derived from a study of the conditions of life in Lake Patzcuaro; the shells of various genera seem to be modified in such definite directions that the problem of the origin of certain forms would probably be presented to the observer in comparatively simple terms. It is unfortunate that although some hundreds of shells of various species were collected there by Prof. Heilprin and Mr. Baker, their limited time did not permit them to gather information on the physical characteristics of the lake.

Family **AMNICOLIDÆ** Tryon.¹

Genus **POTAMOPYRGUS** Stimpson.

This genus of spinose rissoids is represented throughout Central America and the West Indies by numerous forms; also extending into Northern South America, and to the northward ranging as far as Comal County, Texas.

The species are excessively polymorphic, and their number can only be ascertained after a great number of specimens have been examined. As a rule, without exception, every species (or variety, whichever the forms prove to be) is dimorphic; there is a spinose, angulate form, and an acuminate, ecarinate one. Generally both are found in the same locality. This curious dimorphism has caused at least two names to be applied to every species or form. Thus, *Paludina crystallina* Pfr. is the ecarinate form of *P. coronata* Pfr.; *Hydrobia Texana* Pilsbry bears a like relation to *P. spinosa* Call & Pilsbry, etc., etc.

Potamopyrgus is a genus of great antiquity, extending at least as far back as the early eocene. It now comprises all of the fresh-water rissoids of New Zealand, a majority of those of Australia, with species in west Africa and tropical America.

As a contribution to the life-history of these interesting little snails, I may mention that the form discovered by me in Texas, *P. (coronatus* var?) *spinus* C. & P., is viviparous. The young are globular, translucent, having a little over one whorl at birth.

¹ As a sectional term under *Amnicola* I would propose the name CINCINNATIA for *A. Cincinnatiensis*, founding the distinction upon its more minute radula and the far finer denticulation of the teeth.

As to the number of naturally defined Neotropical species I am in doubt; but the examination of my material (including as many as 4 pint of the shells of some species) causes me to believe that there are about four or five, although this may possibly be either over or under estimated. I do not undertake here a revision of them for the reason that Crosse and Fischer have already reached the Hydrobiidæ in the progress of their magnificent work.

Ancey's *Pyrgophorus* (Bull. Soc. Mal. Fr. v, p. 188, 192, 1888) is a synonym of *Potamopyrgus*. Curiously enough, Mr. Ancey does not seem to be aware that any spinose rissoids had been described from America! He proposes the name *P. coronatus* (*de novo*, not of Pfeiffer), for the form found at Vera Cruz, which Strebel calls *P. coronatus* Pfeiffer. This form is doubtless the same as my *P. spinosus* from Texas, but it is doubtfully distinct from the species as found further South.

***Potamopyrgus coronatus* Pfr. Var.**

Highly sculptured forms, probably referable to this species were collected at Shkolak (61595), Merida (61597) and between Sitalpech and Tunkas (61576), in Yucatan.

***Potamopyrgus Bakeri* Pilsbry, n. sp. (pl. XV, figs. 9, 10, 11.)**

P. Bakeri Pilsbry, The Nautilus iv, May, 1891.

Shell slender, elongated, tapering, the altitude more than twice the diameter. Whorls $5\frac{1}{2}$, very convex, separated by deeply impressed sutures; apex somewhat obtuse. Aperture small, ovate, its length contained more than three times in the length of the shell; peristome continuous, thin. Umbilicus a closed rimation behind the inner lip. Surface marked by delicate growth-lines, having low, inconspicuous longitudinal folds (sometimes quite regular and well marked on the upper whorls), and encircled by numerous fine, subobsolete spiral striæ. Alt. 4, diam. 1.9 mm.

Dug from the bank of a stream east of Yautepec, Mexico. (61578).

The specimens being subfossil are denuded of the epidermis and white in color. They are in sculpture not unlike some feebly sculptured forms of that truly protean species *Tryonia protea* Gld., but are readily distinguishable from that type specifically, and even, as I believe, generically; for the present species seems to me to be an aspinose form of *Potamopyrgus*, differing from all other known species and forms of that genus in its much more slender, narrow

contour. I have given the name in recognition of the services of Mr. F. C. Baker, who collected the specimens.

Genus **PYRGULOPSIS** Call & Pilsbry.

Proc. Davenport Acad. Nat. Sci. vol. v, p. 9, May, 1886.

This genus was proposed for a number of small shells which agree in being ovate-conical or turreted, the whorls having a single strong carina at the periphery, which may or may not be concealed on the spire. The apex is acute. There are $4\frac{1}{2}$ to 6 whorls. Aperture ovate, peristome continuous. Axis imperforate. The dentition is figured in the place cited above. The genus has nothing to do with *Pyrgula*, which belongs to a different subfamily (*Baikaliinæ*).¹ *Lyrodus* of Döring² may prove more nearly related.

It has been suggested to me that the finding of carinate forms of *P. Nevadensis* proves that the carinate forms are distorted by the influence of the concentrated waters of the lakes inhabited by the species; but would any malacologist seriously advocate the view that the smooth spineless forms of *Potamopyrgus* hold a like relation to the spinose, carinate types? or that the two Mississippi Valley species of *Pyrgulopsis* (found in company with perfectly normal specimens of *Amnicola*, *Bythinella*, etc.) owe their carinate contours to the same cause?

Besides the original illustrated monograph of this genus by Professor Call and myself in the Proceedings of the Davenport Academy of Natural Sciences for 1886,³ there has been an "*Etude monographique du genre Pyrgulopsis*" (Bull. Soc. Mal. France, v, p. 185) written by Mr. C. F. Ancey. This paper shows in a high degree the futility of writing about things an author knows nothing about.

The species of this genus are as follows:—

P. Nevadensis Stearns.

Pyrgula Nevadensis Stearns, Proc. Acad. Nat. Sci. Phila., p. 173, figure, (1883).—Call and Beecher, Am. Nat., Sept. 1884, Vol. XVIII., pp. 851–855.—Call, Bull. U. S. Geol. Survey, No. 11, 1884.

Pyrgulopsis Nevadensis Call & Pilsbry, Proc. Dav. Acad. Nat. Sci. Vol. V, p. 10, 1886.—Ancey, Bull. Soc. Mal. Fr. 1888, p. 189.

This form has been found thus far only in northwestern Nevada, in Walker and Pyramid Lakes. Entirely smooth forms, not dis-

¹ Beecher is wholly in error in referring *Pyrgula* to the *Melaniidæ*; a family distinguished from *Amnicolidæ* and *Rissoidæ* by the most obvious external characters, such, for instance, as the genitalia.

² Döring, in Boletín de la Acad. Nac. de Cien. en Córdoba, vii, p. 461, 1885

³ In this paper, *Potamopyrgus spinosus* was considered a *Pyrgulopsis*. I had at that time not yet examined its dentition. See under *Potamopyrgus*.

tinguishable from *Amnicola* have been found. The species is not closely allied to the two following, either of which it would be better to regard as the type of the genus.

P. scalariformis Wolf.

Pyrgula scalariformis Wolf, Amer. Journ. of Conch. vol. v. p. 198, pl. xvii, fig. 3, 1869.

Pyrgulopsis scalariformis Call & Pilsbry, Proc. Dav. Acad. Nat. Sci., vol. v, p. 14, 1886.—Pilsbry, Shells of Forest and Stream, pl. 14, fig. 26.—Ancey, Bull. Soc. Mal. Fr. 1888, p. 190.

For description and figures see Shells of Forest and Stream (in preparation). It has been found only at the original locality, "on the Tazewell shore of the Illinois River." No living specimens have been taken. This species it would be best to regard as the type of *Pyrgulopsis*.

P. Mississippiensis Call & Pilsbry.

Pyrgula scalariformis var. *Mississippiensis* Pilsbry, Amer. Naturalist, Jan. 1886; p. 75.

Pyrgulopsis Mississippiensis Call & Pilsbry, Proc. Dav. Acad. Nat. Sci. vol. v, p. 13, 1886.—Ancey, Bull. Soc. Mal. France, 1888, p. 191.—Pilsbry, Shells of Forest and Stream, pl. 14, figs. 23, 24, 25.

Of this species I have examined very many specimens, dredged by myself in the Mississippi River, at and just below the mouth of Rock River, Illinois. It has characters constantly separating it from the *scalariformis*. Both are figured and described in my handbook of northern U. S. mollusks, Shells of Forest and Stream.

The following species is referred provisionally to *Pyrgulopsis* on account of its similarity in contour to the shells of that genus. In possessing fine spiral lines it resembles *Potamopyrgus*; and if it is found to have the very characteristic dental characters of the last named genus, and is viviparous, it must be transferred.

Pyrgulopsis (?) Patzcuarensis Pilsbry n. sp. (Pl. XV, fig. 8).

The Nautilus, May, 1891.

Shell turritid-conic, elevated. Number of whorls unknown, the specimen being broken; the remaining $3\frac{1}{2}$ whorls are strongly carinated in the middle, concave immediately above and below the keel; the last whorl is obtusely shouldered midway between keel and suture, and the median carina becomes less conspicuous. The aperture is oval, not oblique; peristome continuous, its inner margin thickened. Umbilicus reduced to a narrow fissure. Color of epidermis olive; surface marked by delicate growth lines and excessively fine close spiral striæ.

Alt. 5.2, diam. 3 mm.; Alt. of apert. 2, width 1.3 mm.

Lake Patzcuaro, Mexico (61588).

This form is so distinct that I unhesitatingly describe it, although no perfect specimens were obtained.

In general form the shell recalls the *P. Nevadensis* Stearns, described from Pyramid Lake, Nevada; but the encircling carina is less strong, the portion of the whorl above the keel is much more convex. The fine spiral sculpture of the Mexican shell also distinguishes it.

Genus **COCHLIOPA** Tryon.

Cochliopa Tryoniana Pilsbry, (pl. XV, fig. 12.)

C. Tryoniana Pilsbry, The Nautilus iv, p. 52, September, 1890.

Figures are here given of this species, which is the second of the genus described. It is from Polvon and Rio Fula, Nicaragua. A large number of specimens are before me. They vary greatly in form and sculpture. Sometimes the body-whorl is acutely carinated, and the surface encircled with numerous acute lirulæ, but on some specimens this sculpture is almost obsolete. Old specimens become thick and solid, losing to a great extent, the spiral sculpture.

The measurements of two specimens are as follows:

Alt. 4, greater diam. $4\frac{1}{2}$, lesser 4 mill.

Alt. $3\frac{1}{2}$, greater diam. 4, lesser $3\frac{1}{2}$ mill.

Family **CYCLOSTOMIDÆ**.

Genus **CHONDROPOMA** Pfr.

Chondropoma (Cistula) Largillierti Pfr.

An extremely abundant species in northern Yucatan. After examining several hundred specimens I find that a separation of the more coarsely ribbed forms from the finely decussated examples is not practicable, and I therefore agree with Dr. von Martens in uniting the *Cistula Grateloupi* to *C. Largillierti*. The apex is sometimes retained perfect in adult specimens of this species, several of these anomalous individuals being before me.

The exact localities are: Labna (61472), Santa Ana, near Calcehtok (61473), Silam (61416), Merida (61466), Tekanto (61468, 61467), Tunkas (61464), Uxmal (61463), between Sitilpech and Tunkas (61475), and at Tabi (61474).

The polymorphism of this species is wonderful. Adult specimens vary in length from $17\frac{1}{2}$ to 9 mm. The color varies from a clear yellowish-white with numerous rows of brown spots, to dark red. The shape also is subject to great mutations.

Family **HELICINIDÆ**.Genus **HELICINA** Lam.**Helicina arenicola** Morelet.

A most abundant species in northern Yucatan. The published illustrations very inadequately represent this beautiful species, which is as variable in coloration as the *H. orbiculata* Say. Specimens were collected at Silam (61442), Ticul (61440), Labna (61438), Tabi (61437), Uxmal (61443), Tunkas (61436), Santa Ana near Calcehtok (61439), and between Sitalpech and Tunkas (61441).

Helicina lirata Pfr.

Numerous specimens taken at Labna, Yucatan (61479). Specimens were collected by Mr. C. T. Simpson at Utila Island, off Honduras.

Helicina fragilis Morelet.

Specimens of a small, thin, greenish-horn colored turbinate species were collected at Orizaba (61478), and at Vera Cruz (61477). The columella is toothed exactly as in Strebel's figures (referred by Martens to this species), but the color is not as described by Strebel.

Helicina cinctella Shutt.

Orizaba (61480).

Helicina beatrix Angas.

This species was not collected by the Expedition. From an examination of Gabb's specimens I am led to believe that von Martens is in error in referring this species to *H. flavida* Mke. Adult specimens of *H. beatrix* measure alt. 10, diam. 9 mm., and differ as much from Guatemala specimens of *H. flavida* as most *Helicinas* do from one another—certainly enough for specific discrimination. The illustrious writer in the *Biologia Centr. Amer.* probably had not seen authentic specimens.

Sub-genus **SCHAZICHEILA** Shutt.

Schazicheila alata Mke.

Orizaba (61485).

Family **PROSERPINIDÆ**.Genus **PROSERPINA** Gray.**Proserpina (Ceres) Salleana** Cuming.

Both the red and the buff forms were collected at Orizaba (61455 and 61454).

APPENDIX A.

During the few hours spent in Havana the following species were collected by Mr. Baker :

- Oleacina solidula* Pfr. (61605).
Stenogyra octona Ch. (61573).
Patula vortex Pfr. (61604).
Polygyra paludosa Pfr.
Carocolus (*Thelidomus*) *auricoma* Fér., var. *zeta* Pfr. (61572.)
Bulimulus sp.
Limnæa Cubensis Pfr.
Vaginulus occidentalis Guild.

The specimens were marked by a longitudinal row of angular black spots on each side of the middle, on most individuals coalescent into black stripes.

Ampullaria conica Wood. (61574.)

EXPLANATION OF PLATES.

PLATE XIV.

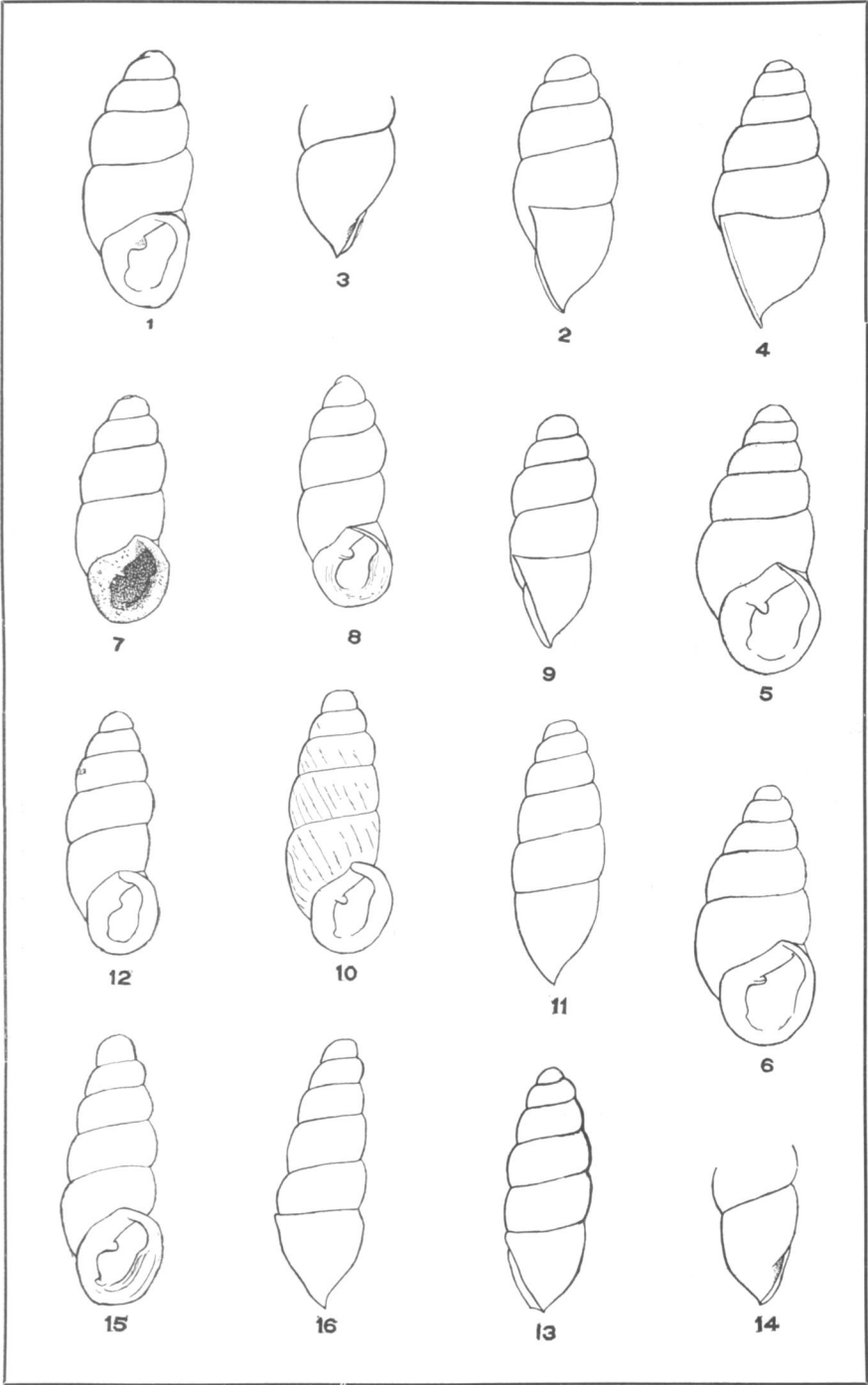
- Figs. 1, 2. *Carychium exiguum* Say, typical. Drawn from specimens from Kent, Ohio, collected by Geo. W. Dean.
 3. *Carychium exiguum* Say, showing umbilicus. Specimen from Vermont.
 4, 5, 6. *Carychium occidentale* Pilsbry. Portland, Oregon.
 7, 8, 9. *Carychium Mexicanum* Pilsbry. Orizaba, Mexico.
 10, 11. *Carychium exile* H. C. Lea. Kent, Ohio.
 12, 13, 14. *Carychium exile* Lea. Specimen with thick peristome.
 15, 16. *Carychium exile* var. *Jamaicense* Pilsbry. Jamaica. (Swift Collection).

NOTE. The profile views are all drawn with the shell rolled to the left only enough to bring the plane of the inner and outer lips coincident with the line of vision. The figures of this plate are drawn to the same scale.

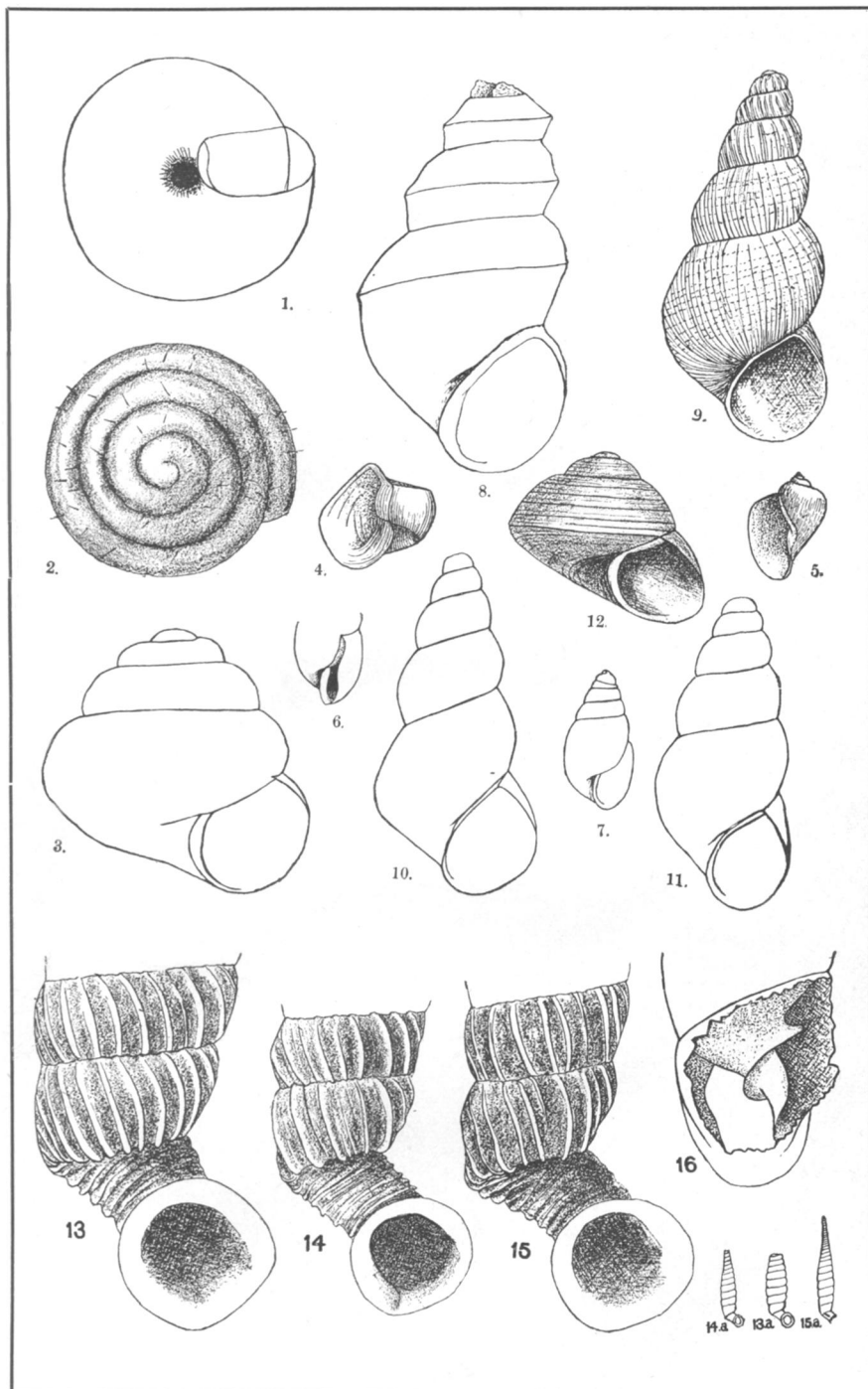
PLATE XV.

- Figs. 1, 2, 3. *Patula intonsa* Pilsbry. Three views of type, specimen, highly magnified.
 4. *Planorbis tenuis* Phil. var. *Boucardi* C. & F. Lake Patzcuaro, W. Mexico. Natural size.
 5. *Physa osculans* Hald, var. *Patzcuarensis* Pilsbry. Lake Patzcuaro. Natural size.
 6, 7. *Oryzosoma Tabiensis* Pilsbry. Magnified view of the type, with profile of aperture. Hacienda of Tabi, Yucatan.
 8. *Pyrgulopsis?* *Patzcuarensis* Pilsbry. Magnified view of the type. Lake Patzcuaro, W. Mexico.

- 9, 10, 11. *Potamopyrgus Bakeri* Pilsbry. Three individuals, showing variation in contour.
12. *Cochliopa Tryoniana* Pilsbry. View of a highly sculptured form, enlarged.
- 13, 13a. *Cylindrella Bourguignatiana* Ancey. Utilla Island, off Honduras. Specimen collected by Chas. T. Simpson.
- 14, 14a. *Cylindrella speluncæ* var. *dubia* Pilsbry.
- 15, 15a. *Cylindrella speluncæ* Pfr. Specimen from Ticul, Yucatan.
16. *Carychium exiguum* Say. Specimen broken to show the internal continuation of the columellar folds.



PILSBRY, MOLLUSCA OF YUCATAN AND MEXICO.



PILSBRY, MOLLUSCA OF YUCATAN AND MEXICO.